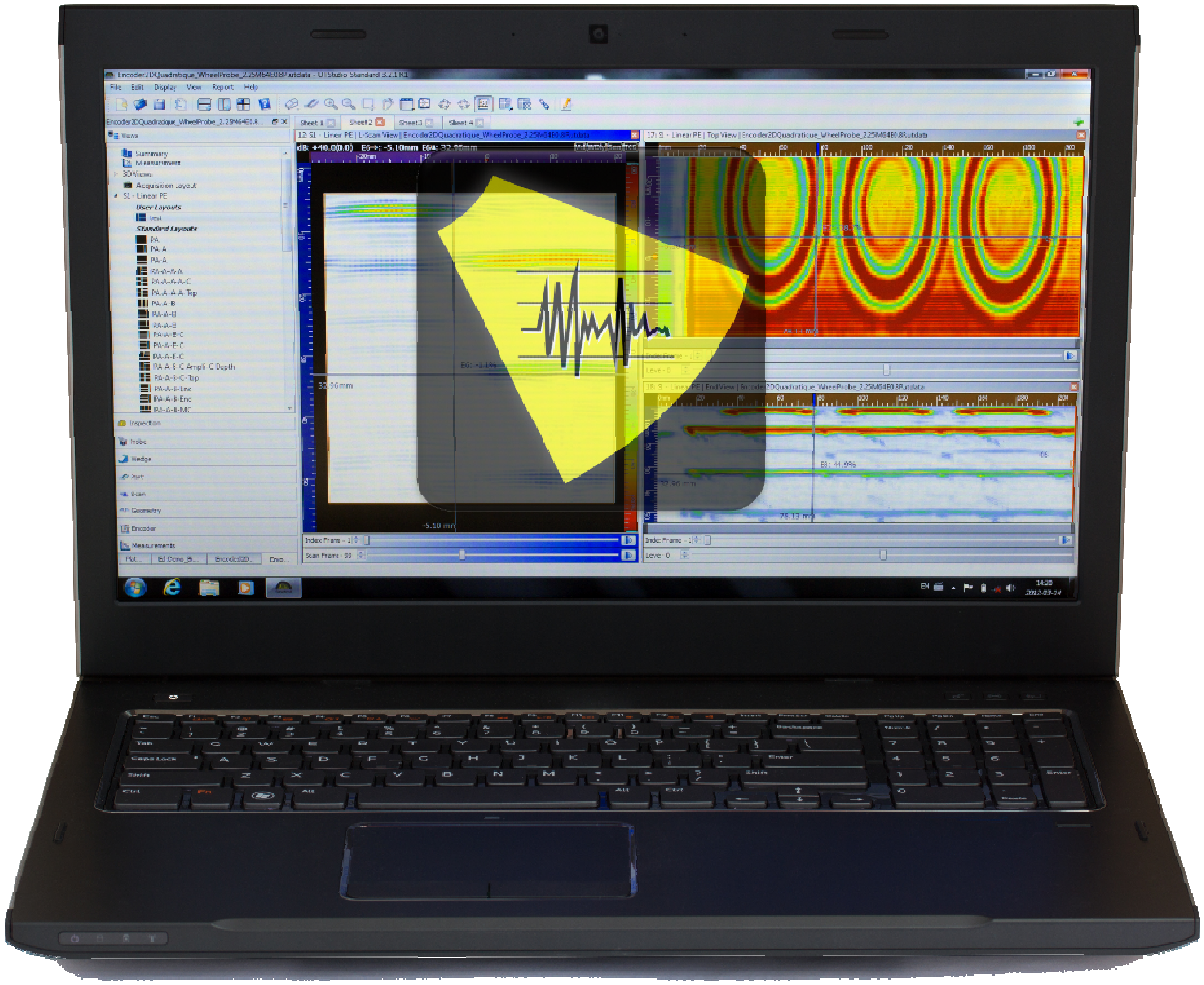
UTStudio Software Quick Start Guide and Imaging Examples

A short guide to get started with UT Software



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Sonatest AP

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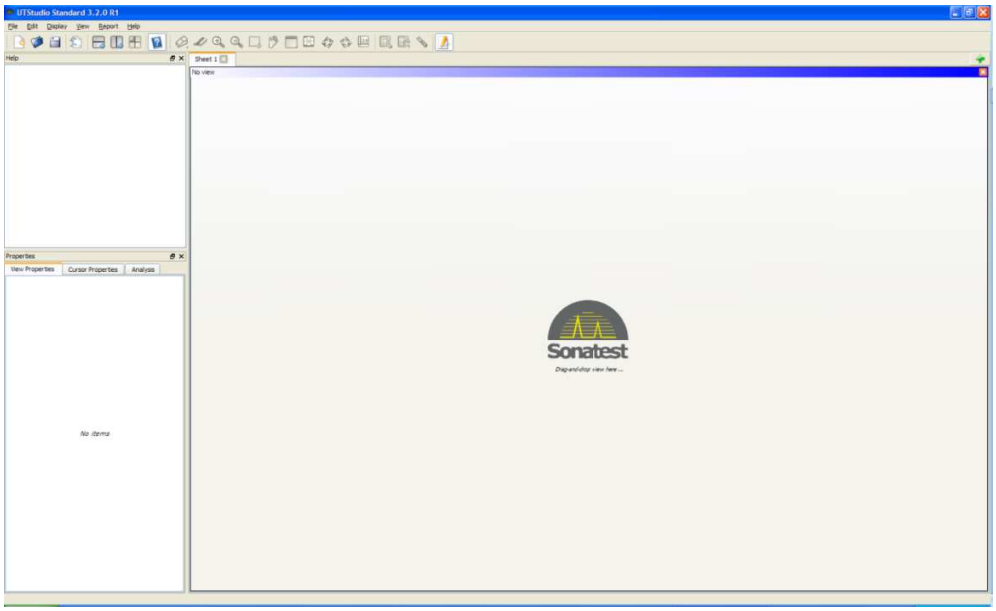
1. Introduction

This quick start guide aims to demonstrate the main features of UTStudio software and its capability to accomplish post analysis data. This document and its related files are also a good tool to perform efficient demonstrations for academic purposes. A quick overview of the software is first presented and then various examples showing the most common defects encountered in plates are explained.

2. UTStudio Quick Start Steps

2.1 First, install UTStudio and launch the application to begin.

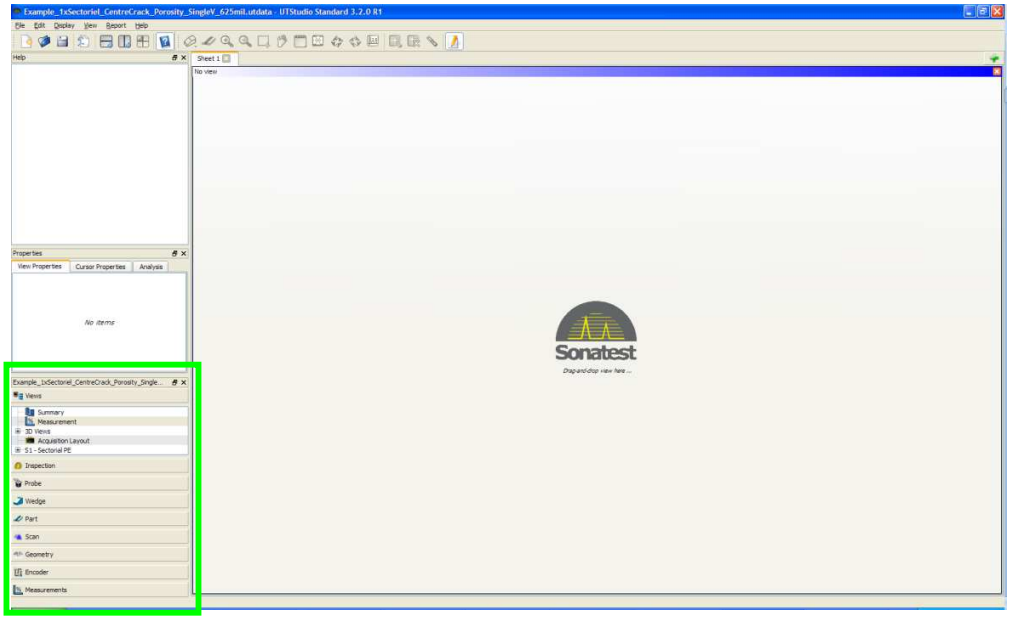


2.2 Open File or Session…

Once UTStudio is launched, first select **File→Open File or Session…** and choose an example file from "My UTStudio Files/Examples". You can also open files and launch UTStudio by double-clicking on a file in Windows Explorer.

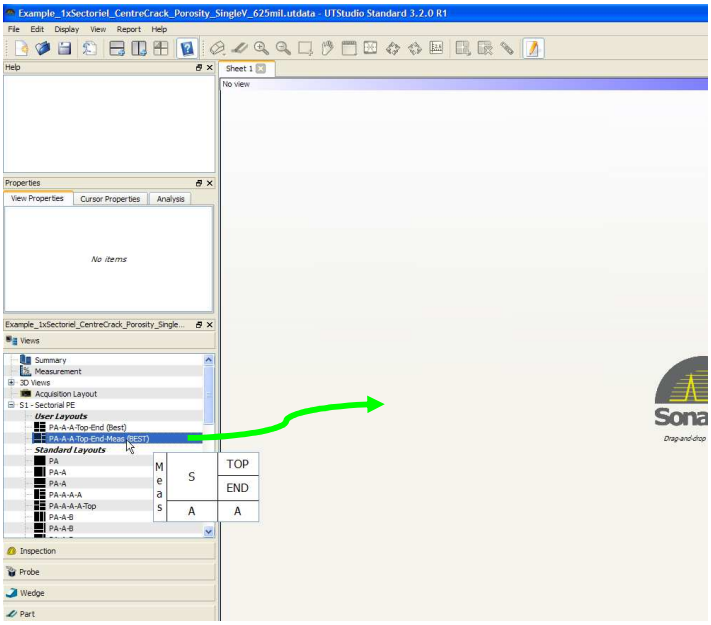
2.3 A new Configuration Pane

A new Configuration Pane will be displayed. All information about the file and its extractions will be available in this pane.



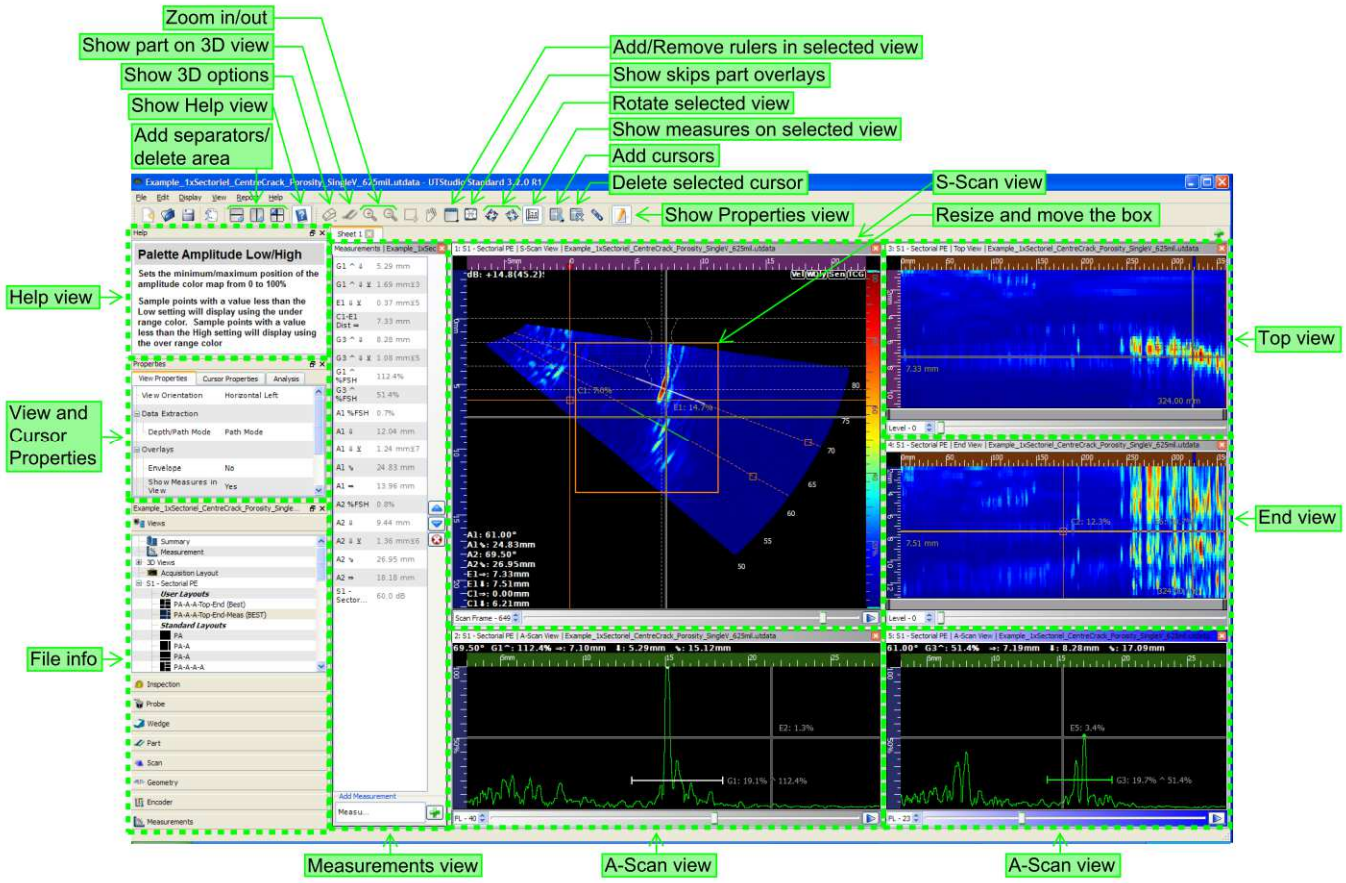
2.4 Select a layout

To select a layout, go in the Configuration Pane / Views (Ultrasonic views are only available with utdata files). Then extend the “S1 – XXXXX” item and choose a layout to drag in the sheet (drag to an empty area). You can choose between the Acquisition Layout (as used on the recording device), Standard Layouts or User Layouts. By moving the mouse cursor on a layout, a small representation of the layout is displayed. By loading a layout, a set of separators, views and cursors gets created automatically. Standard Layouts have been prepared by SONATEST but can be customized to better fit your needs and can be saved as new User Layouts.



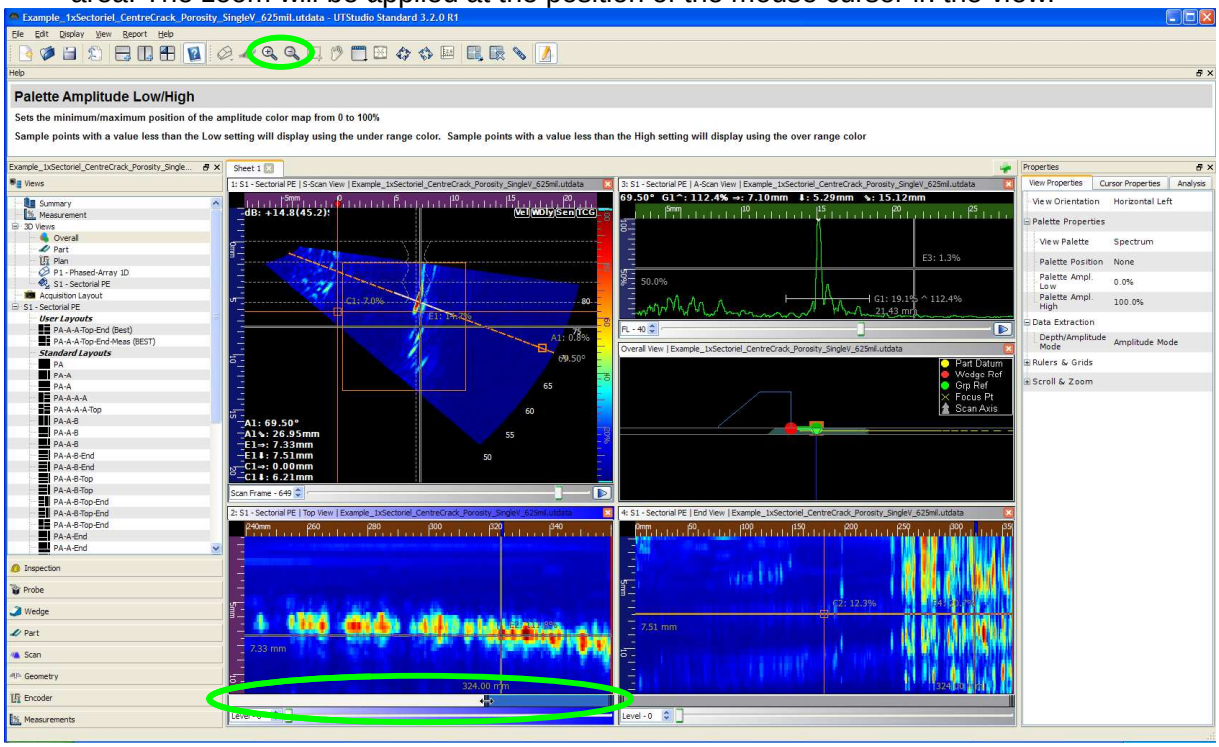
2.5 Use the toolbar buttons to customize the layout

Once a layout has been loaded, you can use the toolbar buttons to customize the layout. Also, by right-clicking on a cursor or a view, additional options are shown. Some cursors are linked; for instance, moving the Cartesian Extractor cursor in the Top View will bring the corresponding frame at the right position in the S-scan view.



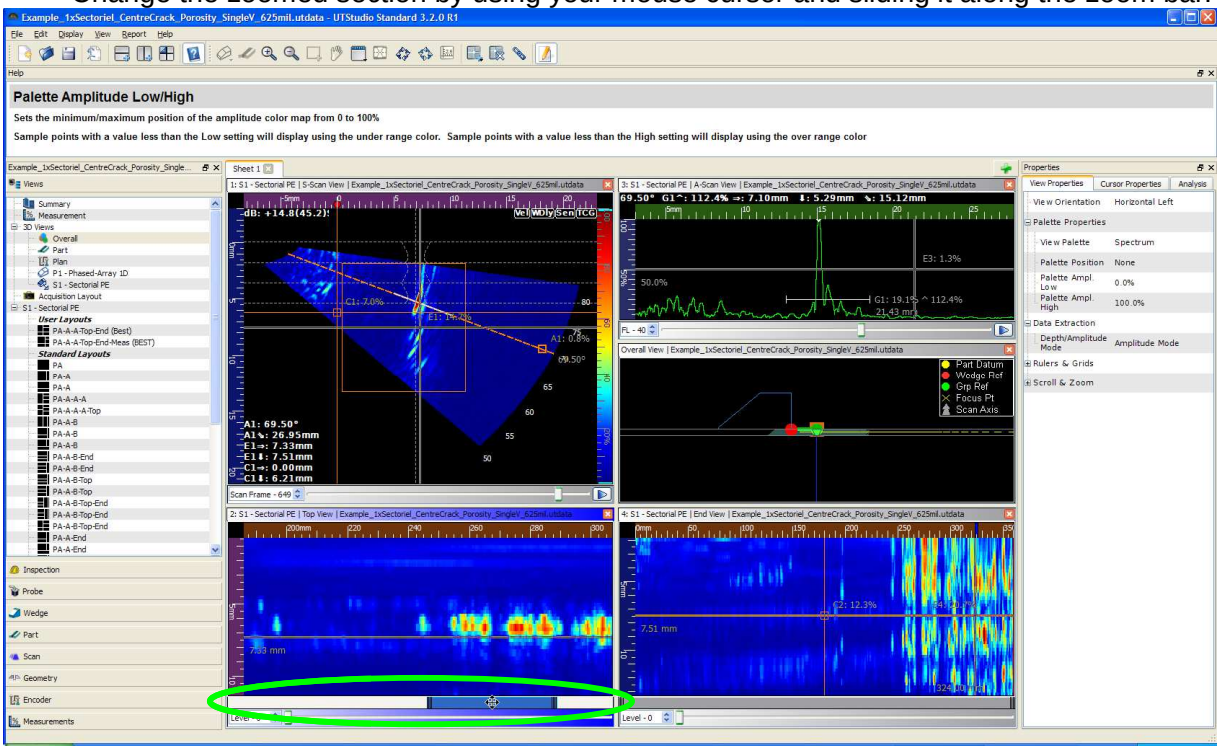
2.6 Zoom in/out buttons

Zoom by using the zoom in/out buttons or by scrolling the wheel of your mouse, in the view area. The zoom will be applied at the position of the mouse cursor in the view.



2.7 Change the zoomed section

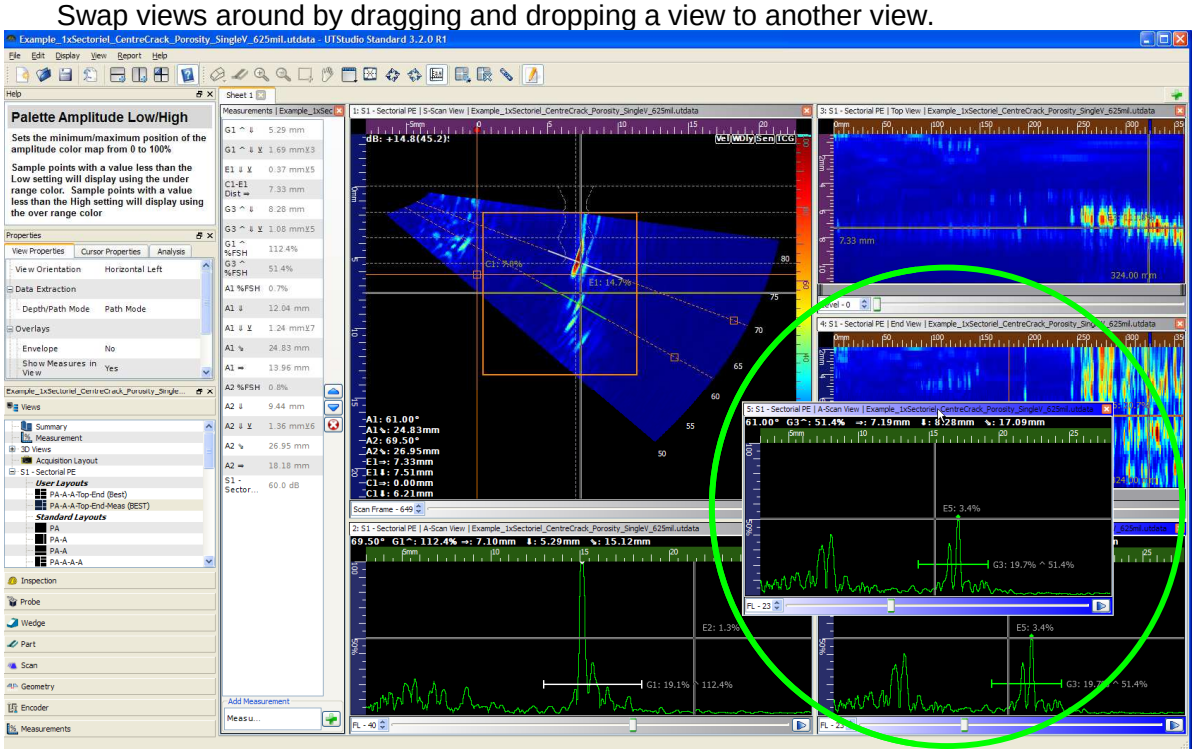
Change the zoomed section by using your mouse cursor and sliding it along the zoom bar.



3. Customizing Layouts and Extracting Views

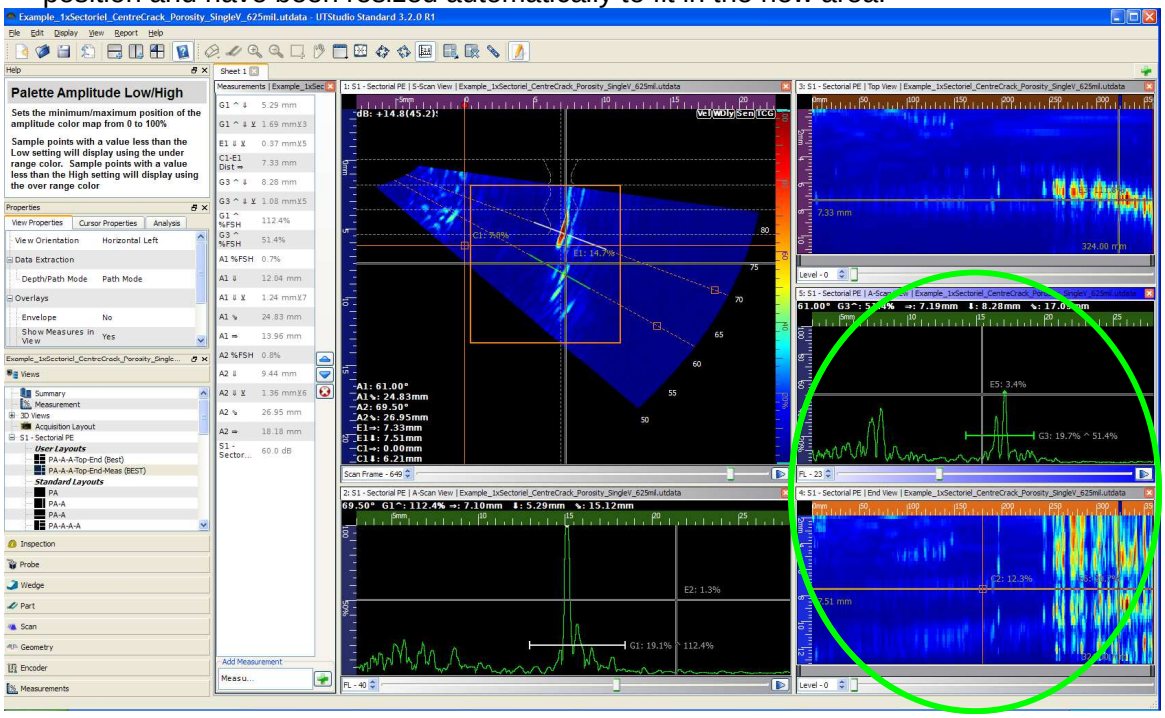
3.1 Swap views around

Swap views around by dragging and dropping a view to another view.



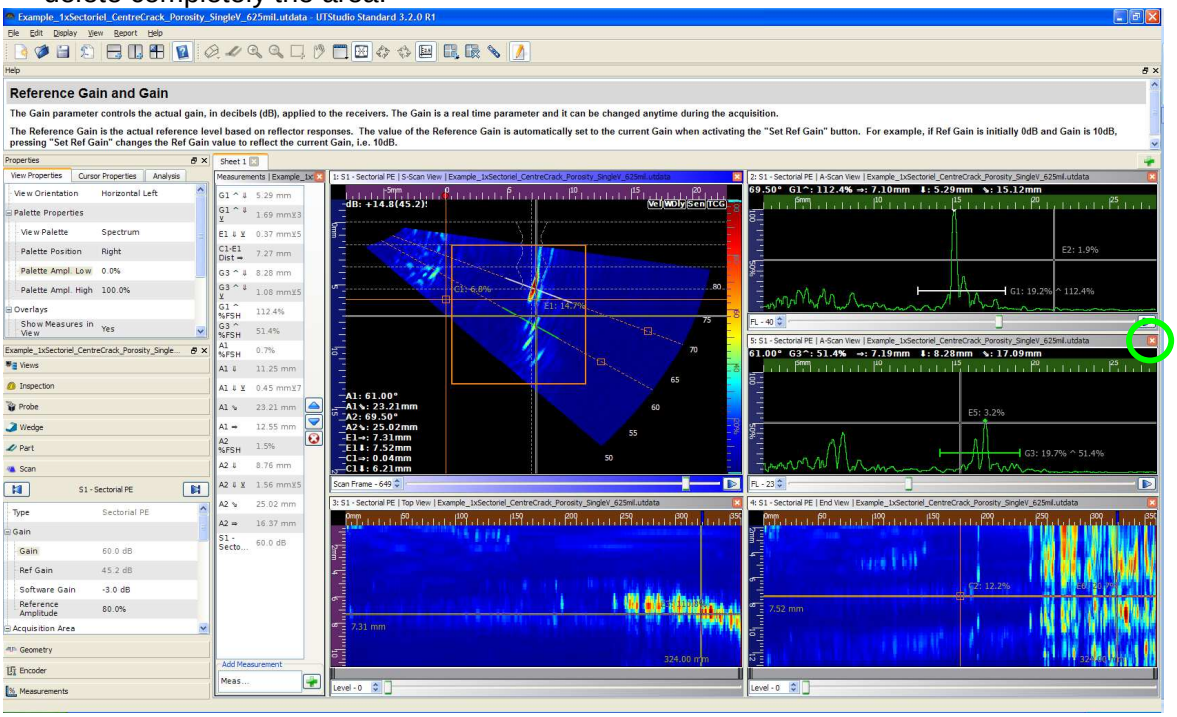
3.2 Both views switched their position

After dropping the view, you have a new layout. Notice that both views switched their position and have been resized automatically to fit in the new area.



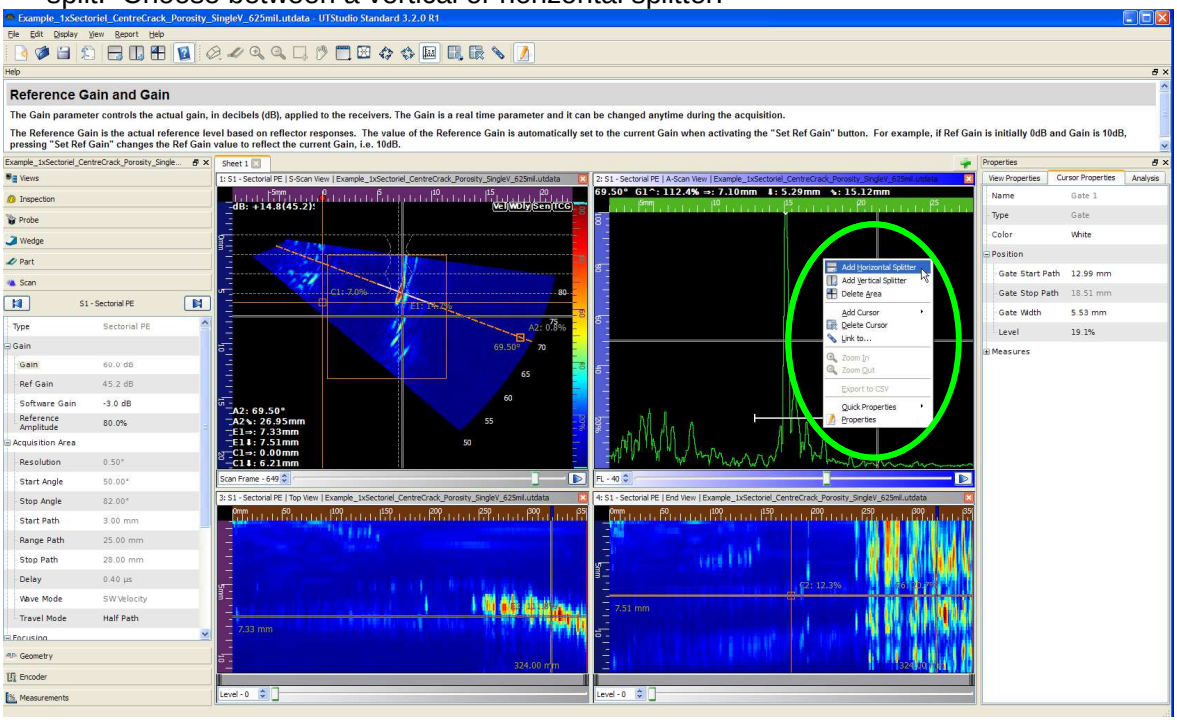
3.3 Delete a view and an area

After a few changes, you may get this layout. To delete a view, simply click on the red X on the top right corner of the view. Click one time to delete the view inside the area, two times to delete completely the area.



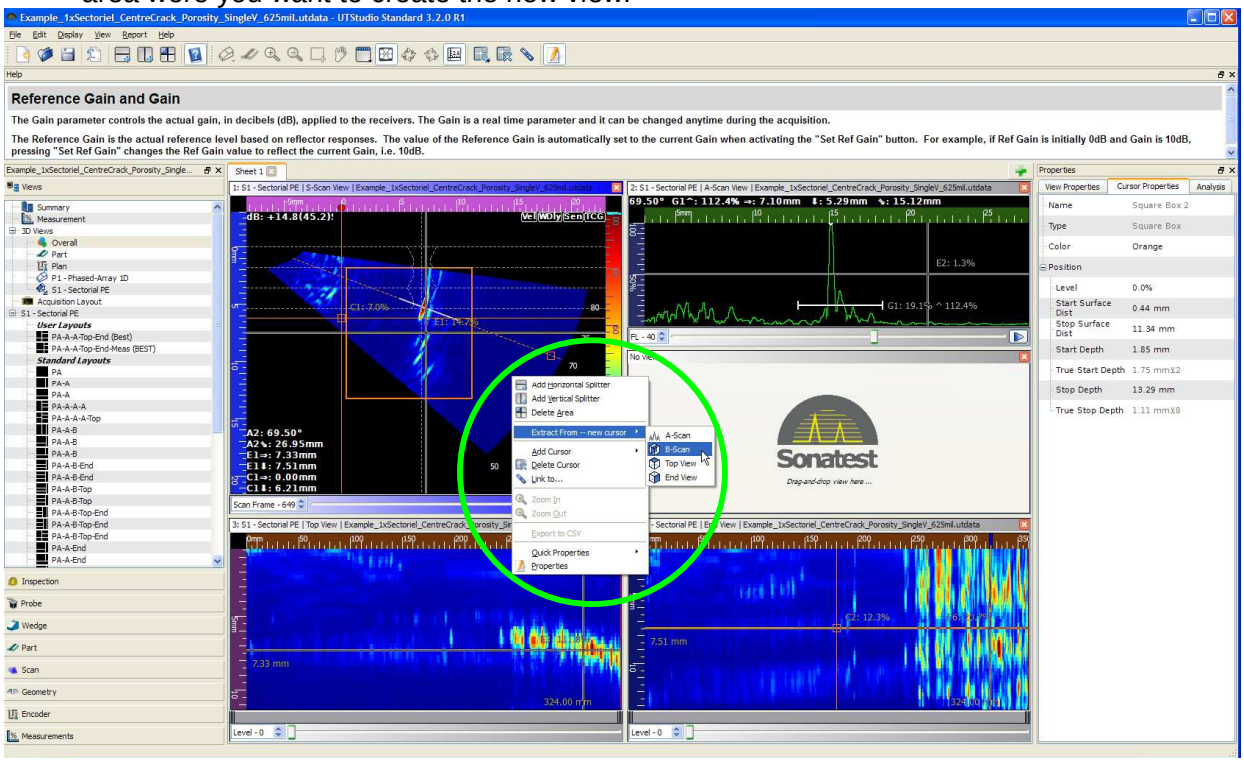
3.4 Add a new empty area

To add a new empty area available for a new view, right-click on the view that you want to split. Choose between a vertical or horizontal splitter.



3.5 Extract a new view

After you created an empty area, choose the view you want to extract in it by right clicking on the S-scan or L-scan view. Then left-click on the wanted view and click again on the empty area were you want to create the new view.

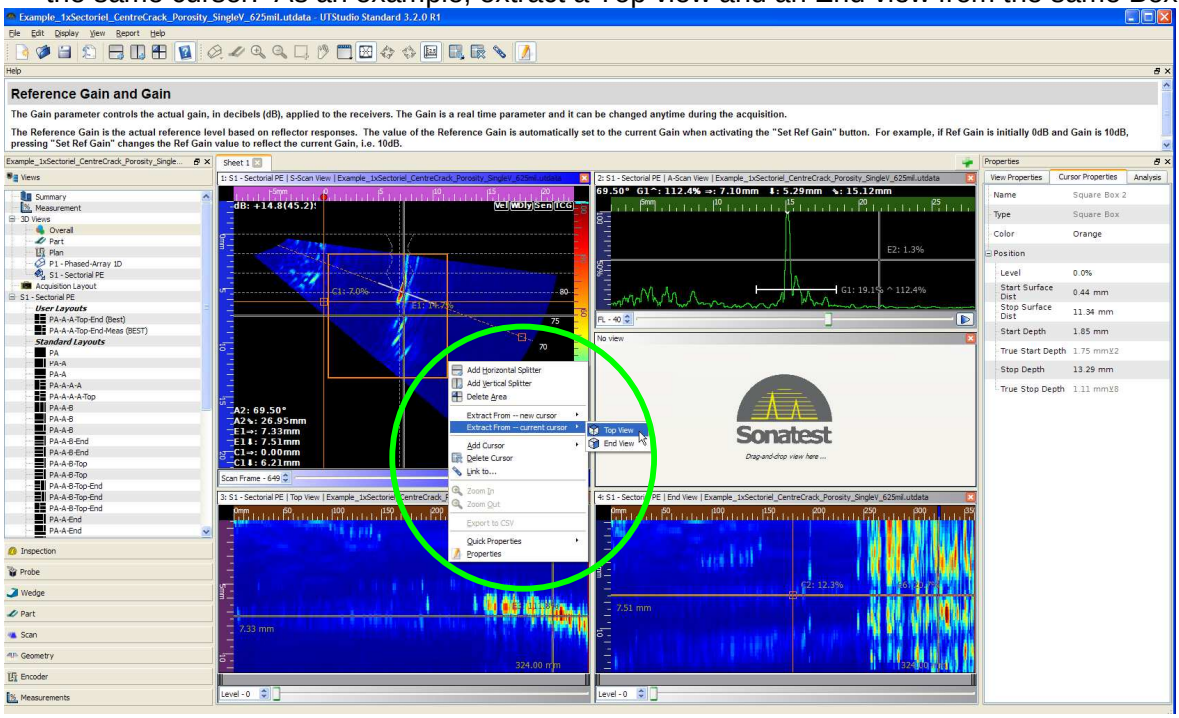


3.6 Available view extractions

Views extracted from S-scan or L-scan are: A-Scan, B-Scan, Top and End view. You can extract a C-scan only from an A-scan that was extracted from a Linear scan.

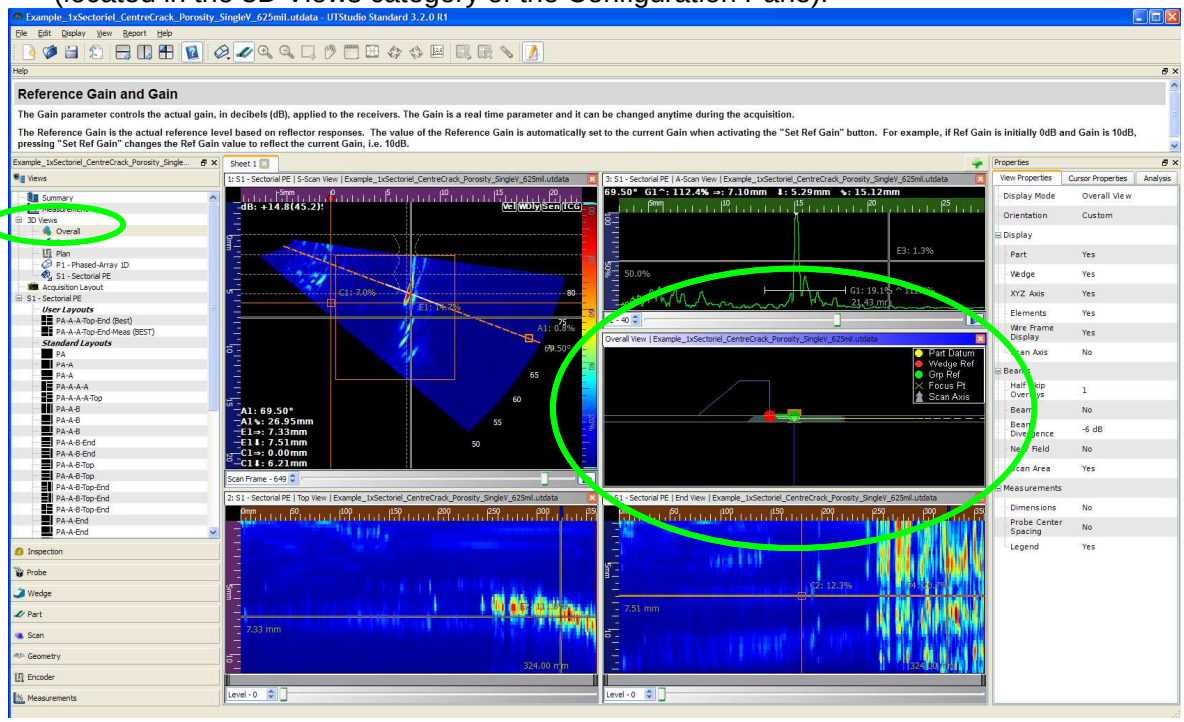
3.7 View extraction from cursors

By right-clicking on an existing cursor in a view, you can sometimes extract another view from it, depending on the type of cursor. It is thus possible to have multiple views extracted from the same cursor. As an example, extract a Top view and an End view from the same Box.



3.8 Display a 3D view in the empty area

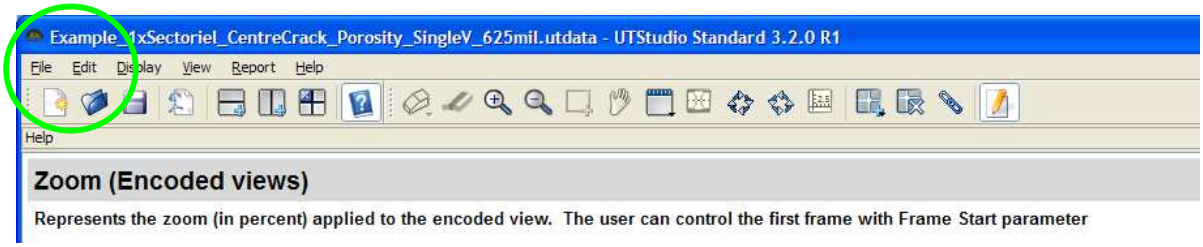
You can also put a 3D view in the empty area by dragging and dropping the Overall view (located in the 3D Views category of the Configuration Pane).



4. UTStudio Multiple Files Analysis

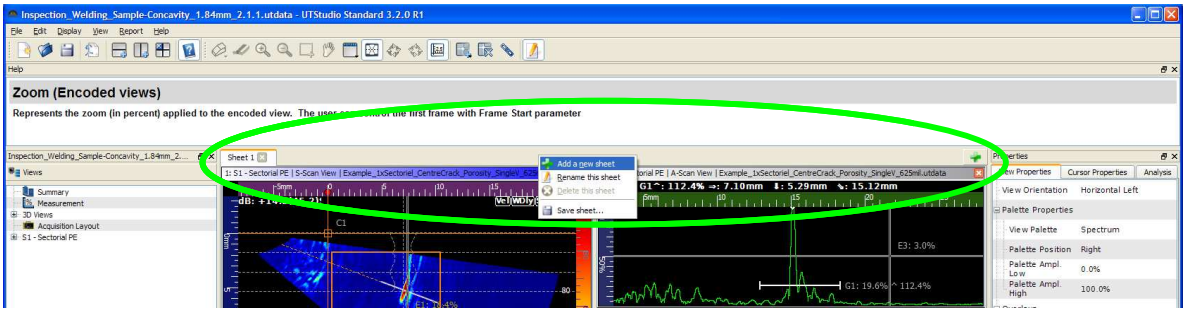
4.1 Open a second file in UTStudio

To open a second file in UTStudio, go to **File→Open File or Session…** and open the file (as seen in step 2.2). You can also open a file or a session by a left-click on the Open File button or by doing Ctrl+O. A second Configuration Pane will appear on the left-hand side showing all its parameters.



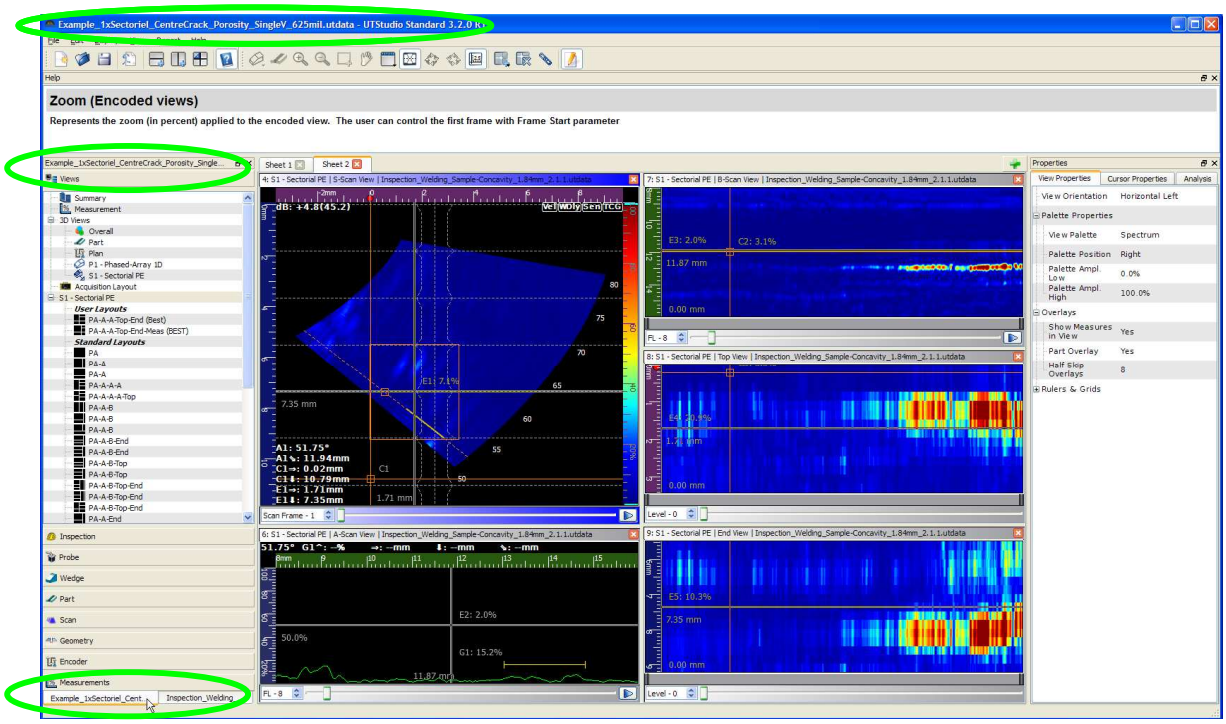
4.2 Add a new sheet

You can add an empty sheet by right clicking on the bar just above views and select **Add a new sheet**, or left click on the button at the top right of the sheet bar. Then, a different layout can be loaded in this new sheet by dragging and dropping as seen in step 2.4.



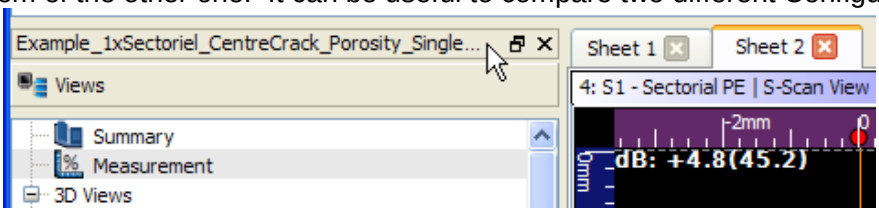
4.3 Toggle between files

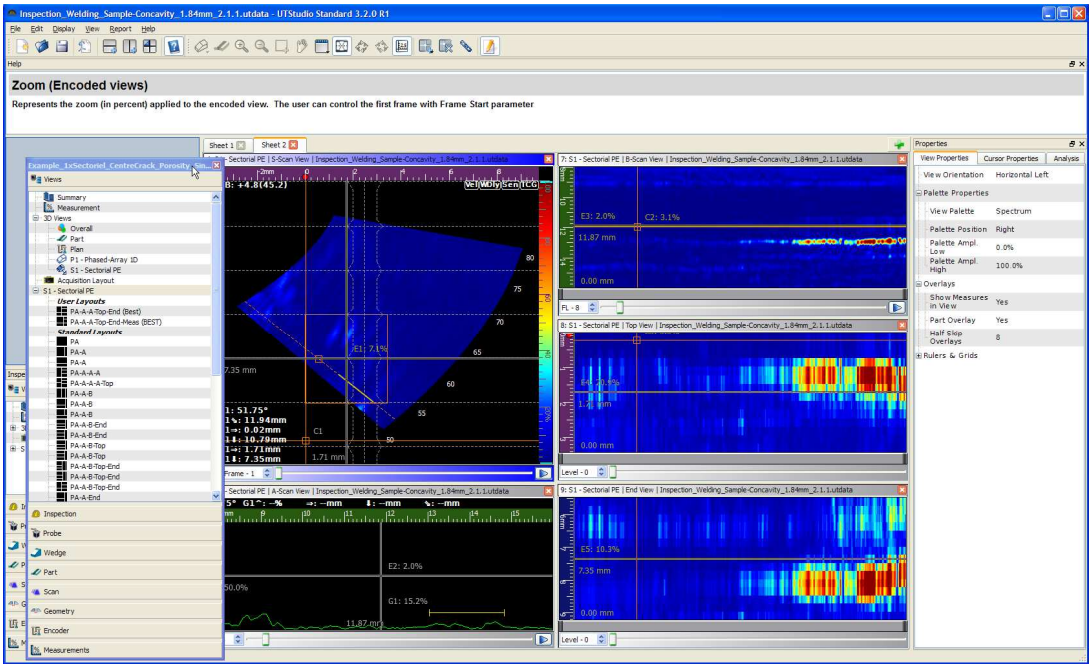
Toggle between files by using the tabs at the bottom of the Configuration Pane. Notice that you can see the name of the current file at the top of the Configuration Pane and of the window. Toggle between sheets by using the sheet bar. Notice that both actions work separately, so toggling between Configuration Panes doesn't change the current sheet and vice versa. Also notice that the current or selected file that is shown in the Configuration Pane is the one underlined in yellow in the tabs.

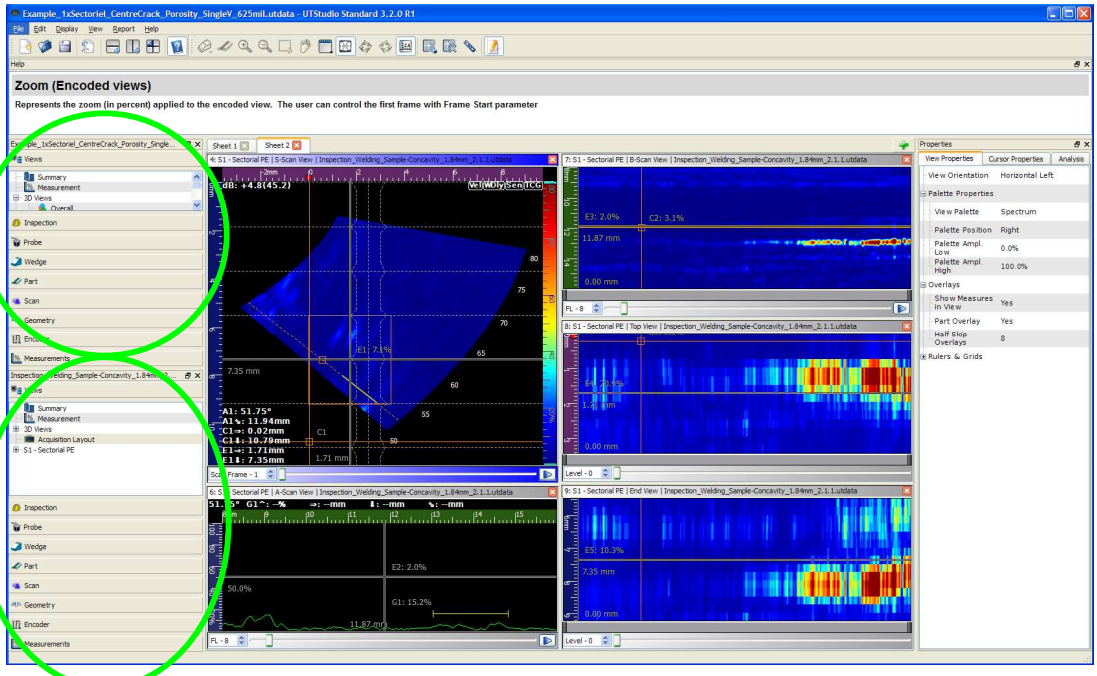


4.4 Display two Configuration Panes side by side

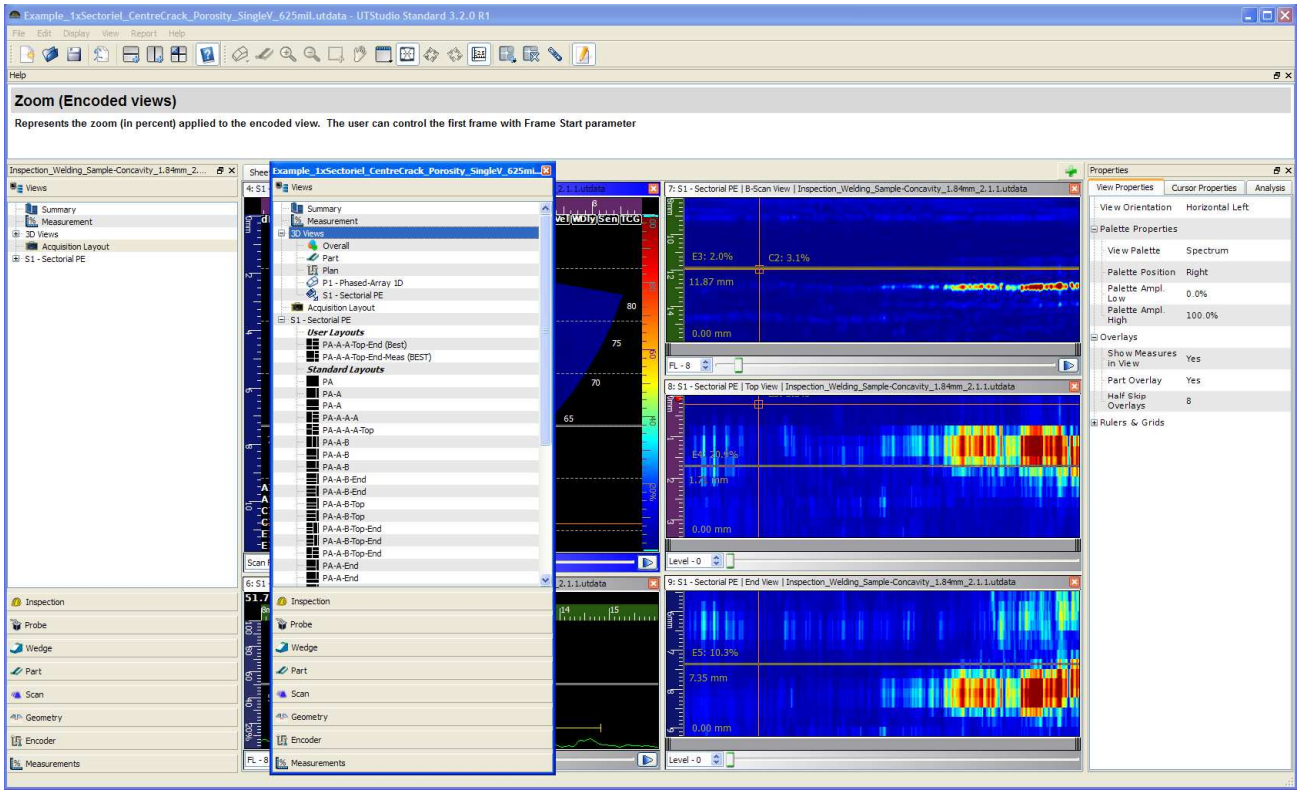
To have two Configuration Panes visible side by side, you can drag and drop just at the top or the bottom of the other one. It can be useful to compare two different Configuration Panes.





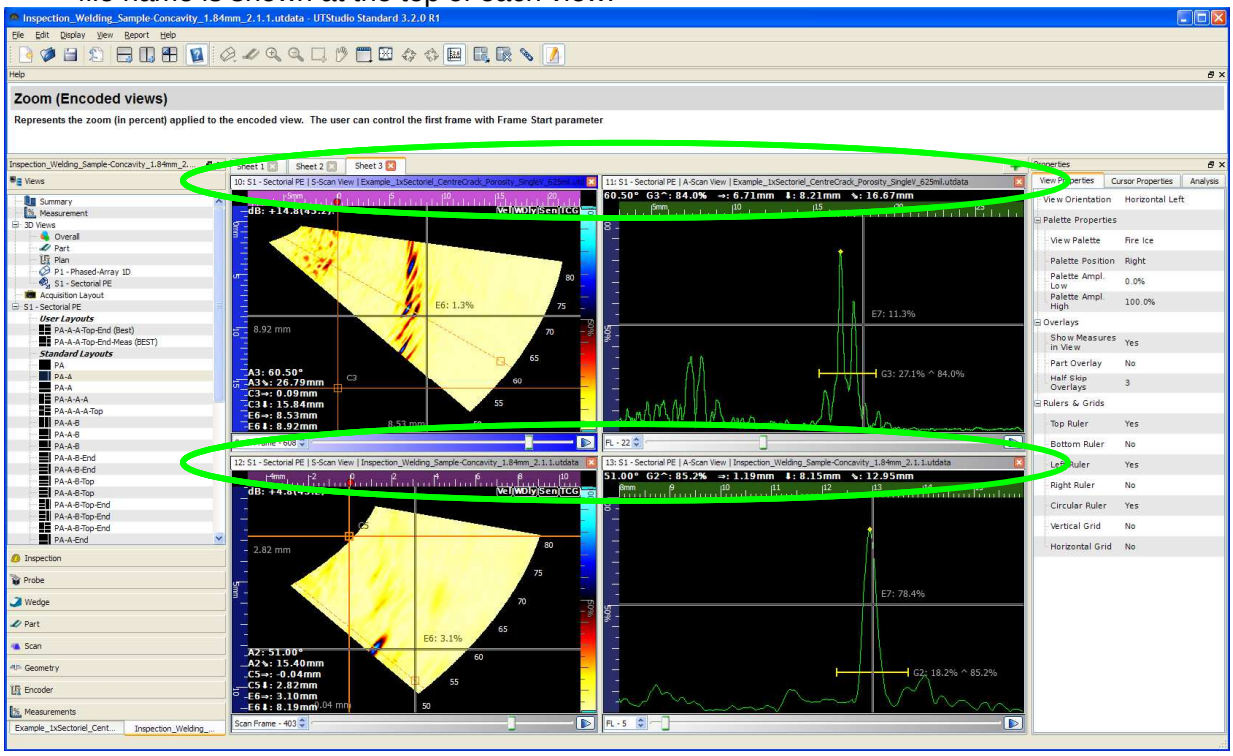


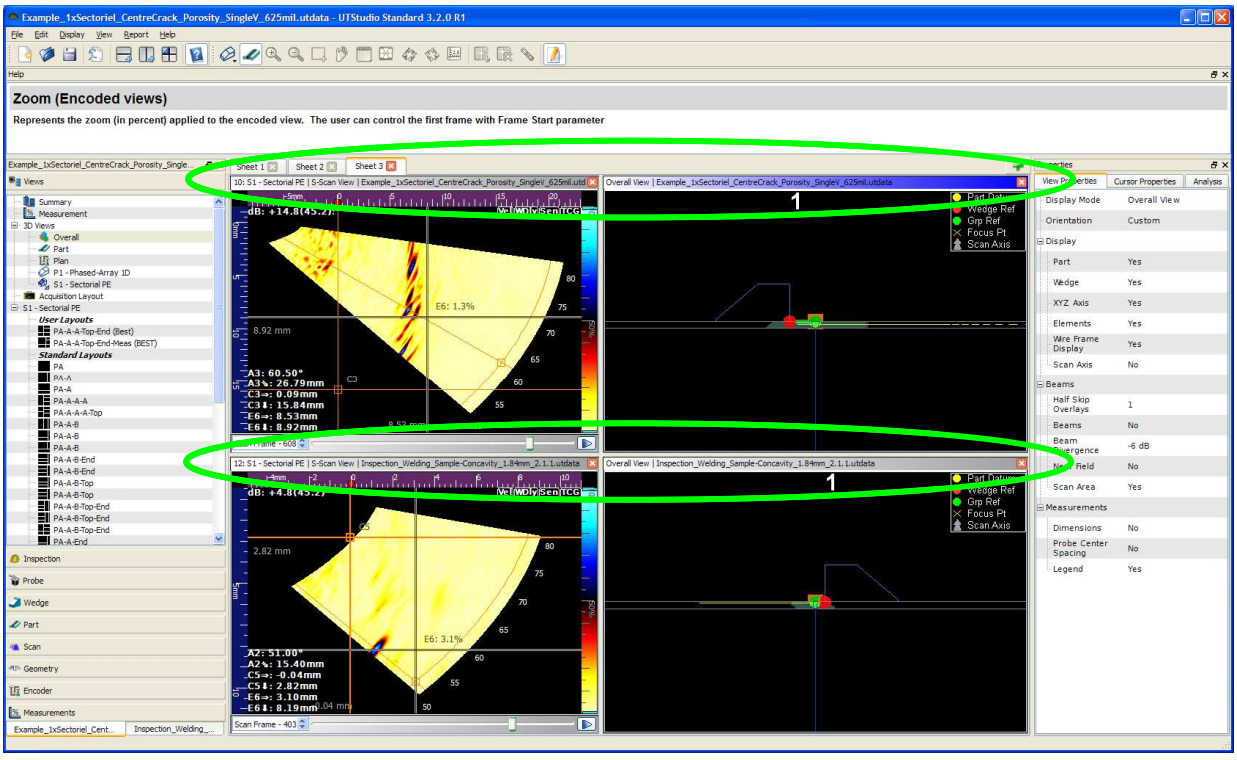
Or just drop it anywhere else in the window and it will become a detached window itself (and you can resize it as you want).



4.5 Toggle between Sheets

Toggle between Sheets by left clicking on the tab at the top of views. It is possible to have two views from two different files in the same sheet. Be sure to select the good file Configuration Pane for dragging and dropping the view from the proper file. Notice that the file name is shown at the top of each view.





5. Imaging Test Setup

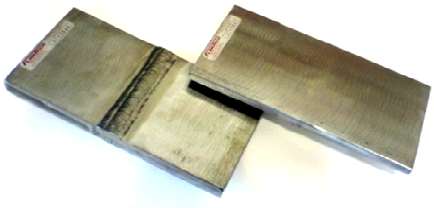
All the results presented below have been obtained by using the following equipment.

VEO 16:64 Portable Phased Array Instrument
SONATEST

Type 1 DAAH Adaptor
SONATEST
Model # : ASM-9038-HY200
Serial # : 0124

Type 1 DAAH Probe
SONATEST
Model # : Sonatest-T1-PE-7.5M44E0.6P-35W0D

QuickTrace Type 1 Clip
SONATEST
Model # : ASM-0203-HD200
Serial # : 124



Flaw Tech Plates
Flaw Manufacturing Technology
Material Type : Carbon Steel

Ultragel II Couplant
Sonotech

6. Results Presentation

The following results were obtained by scanning the plates as shown on the figure below. Notice that the data acquisition always starts from the reference edge following a parallel movement along the weld. Also, the probe is located on the opposite side of the ID Label and the dimensions shown are valid for every example.

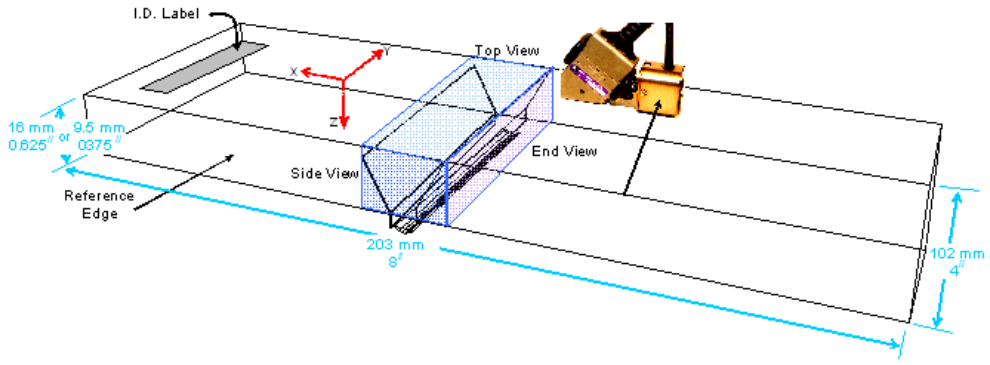


Figure 1: Setup to perform the inspection with plate dimensions

Each plate contains two defects. When the results are displayed, it is possible to see each flaw and its specific location. Also, a Top view and an End view are extracted from the Extraction box (see orange box figure 3) inside the S-Scan. Since both the Top and the End view are projected views, they show the cumulated amplitude throughout the volume. Refer to figure 1 to understand what is displayed by the Top and End view.

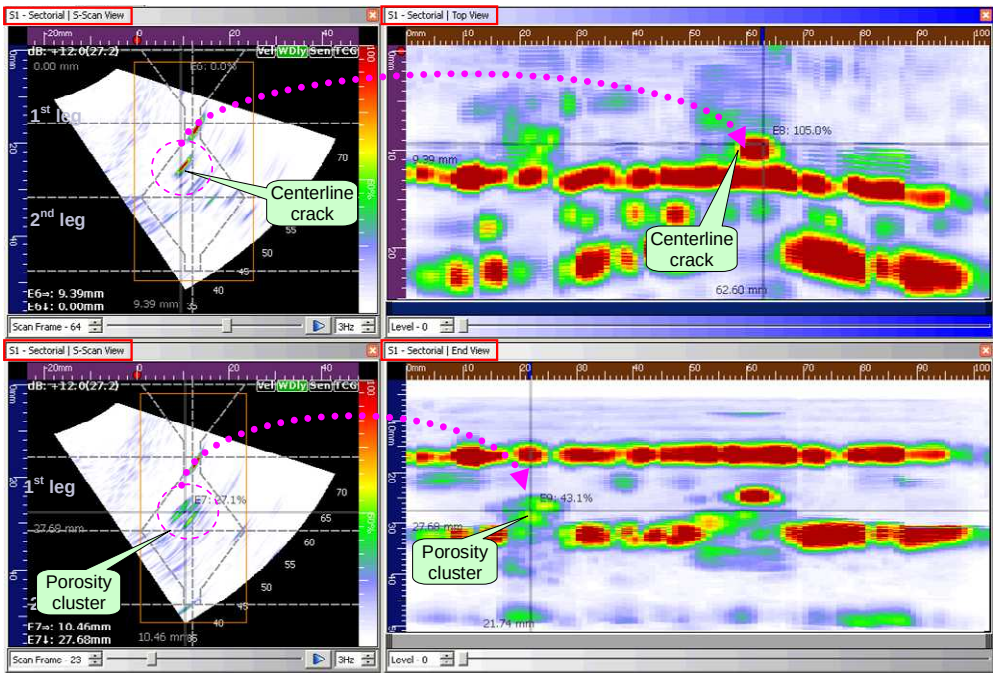


Figure 2: Two S-scan with Top and End view showing two flaws

7. Results Interpretation

The results interpretation is often one of the hardest parts in ultrasound testing. The use of phased array technology obviously gives a great hand to facilitate this part. Here is how these results should be interpreted:

- The Top and the End view are extracted from the extraction box inside the first S-scan. The size of the extracted view is relative to the size of the box.
- The weld overlay shows the approximate weld geometry in the first and second leg.
- The X axis is the surface distance, where 0 is the wedge front, the Y axis is the encoded axis along the weld and the Z axis is the depth.
- The green bubbles indicate either a geometrical echo or a defect.
- The gray Cartesian cursors in the Top and End views indicate the location of the defects.

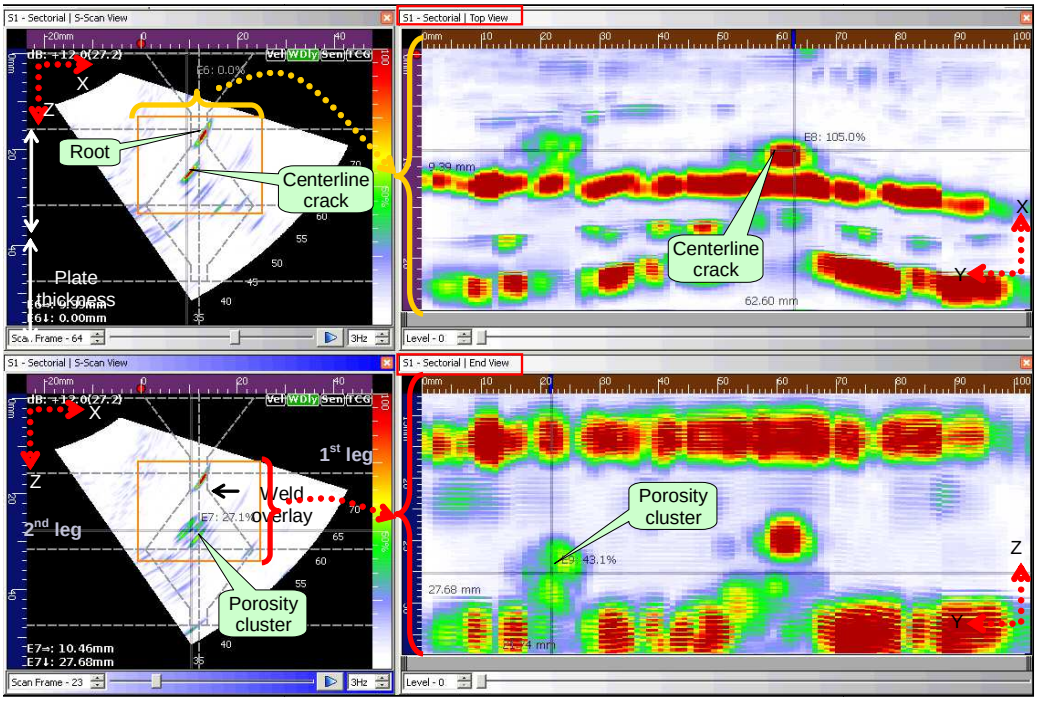


Figure 3: Results interpretation template

8. Examples

7.1 Centerline Crack and Porosity in a Single V 16 mm thick plate

File name: Example_CenterlineCrack_Porosity_SingleV_16MM_ENC_UT3544B_T1-PE-7_5M30E0_6P-35W.huf

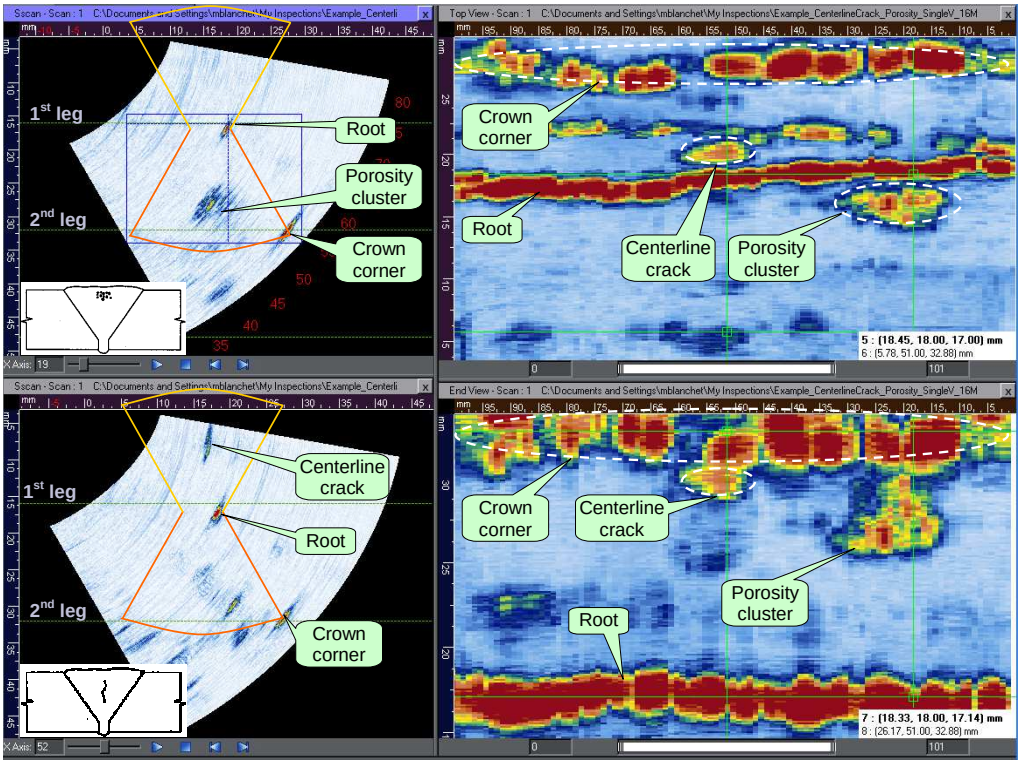


Figure 4: Centerline crack and porosity in single V 16mm thick plate

Table 1: Main configuration parameters

Probe	7.5 MHz, Integral 35°	Gain	26.5 dB
Focal Distance	35.0 mm	Start/Stop Angle	30.00°, 80.00°
Focalisation Type	Constant Path	Start/Stop Path	21.97 mm, 54.92 mm

Table 2: Main values synthesis [1]

Flaws	Start of the flaw to reference	Total flaw length	Flaw height	Flaw depth (below surface)	Location tolerance
Centerline Crack	51 mm (2.0″)	15 mm (0.6″)	3.8 mm (0.15″)	2.5 mm (0.1″)	±4 mm (0.15″)
Porosity	18 mm (0.7″)	8 mm (0.3″)	3.8 mm (0.15″)	2.5 mm (0.1″)	±4 mm (0.15″)

[1] Official values provided by FlawTech

7.2 Lack of Fusion and Incomplete Root in a Double V 16 mm thick plate

File name : Example_LackOfFusion_IncompleteRoot_DoubleV_16MM_ENC_UT3550B_T1-PE-7_5M30E0_6P-35W.huf

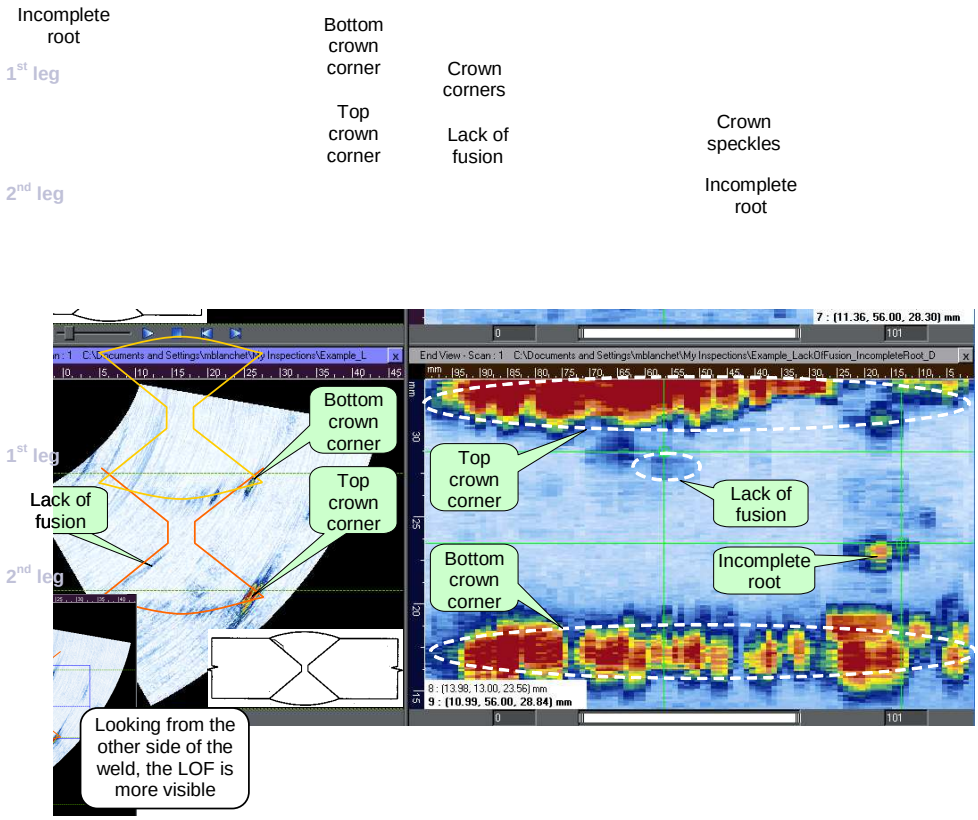


Figure 5: Lack of fusion and incomplete root in a double V 16 mm thick plate

Table 3: Main configuration parameters

Probe	7.5 MHz, Integral 35°	Gain	26.5 dB
Focal Distance	38.0 mm	Start/Stop Angle	30.00°, 80.00°
Focalisation Type	Constant Path	Start/Stop Path	21.97 mm, 54.92 mm

Table 4: Main values synthesis

Flaws	Start of the flaw to reference	Total flaw length	Flaw height	Flaw depth (below surface)	Location tolerance
Lack of fusion	56 mm (2.2″)	15 mm (0.6″)	3.8 mm (0.15″)	2.5 mm (0.1″)	±4 mm (0.15″)
Incomplete root	13 mm (0.5″)	13 mm (0.5″)	3.8 mm (0.15″)	8 mm (0.3″)	±4 mm (0.15″)

7.3 Lack of Fusion on Side Wall and Root in a SingleV 9.5 mm thick plate

File name: Example_LackOfFusion_SingleV_10mm_UT3547B_T1-PE-7_5M30E0_6P-35W.huf

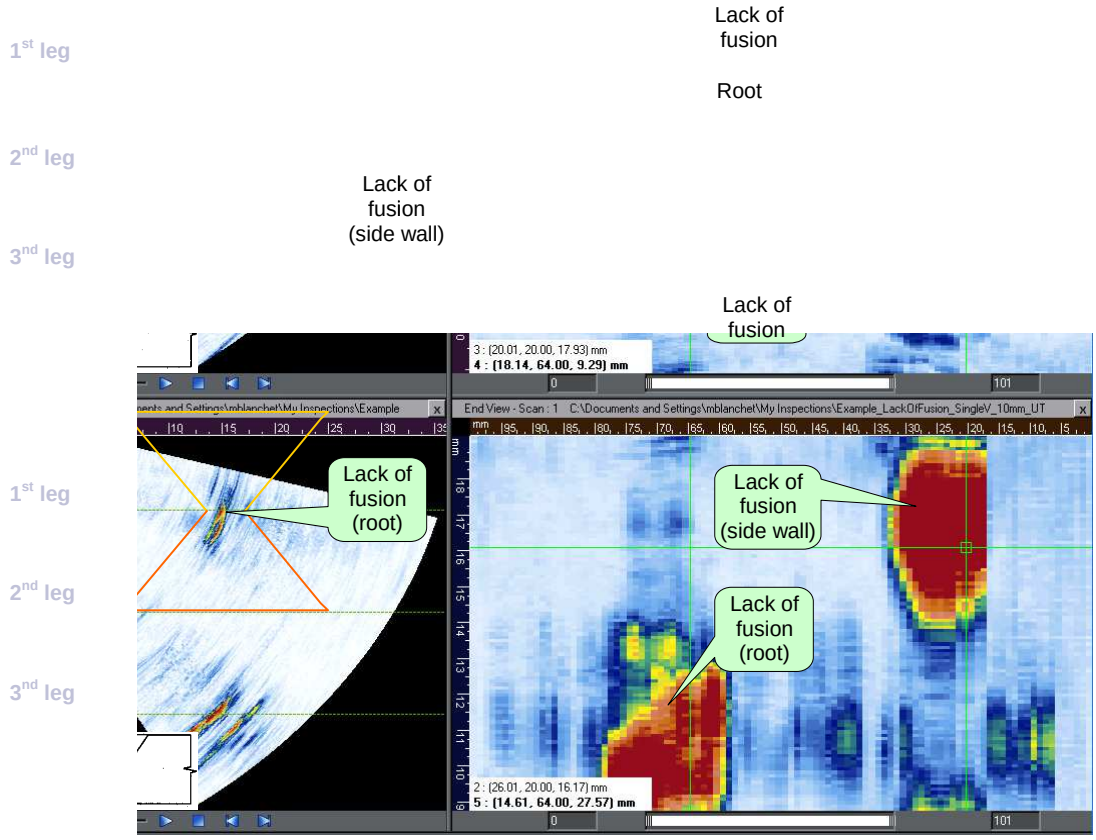


Figure 6: Lack of fusion on side wall and root in a singleV grinded flush 9.5mm thick plate

Table 5: Main configuration parameters

Probe	7.5 MHz, Integral 35°	Gain	20.0 dB
Focal Distance	30.0 mm	Start/Stop Angle	35.00°, 77.00°
Focalisation Type	Constant Path	Start/Stop Path	14.81 mm, 44.95 mm

Table 6: Main values synthesis

Flaws	Start of the flaw to reference	Total flaw length	Flaw height	Flaw depth (below surface)	Location tolerance
Lack of fusion	20 mm (0.8″)	8 mm (0.3″)	3.8 mm (0.15″)	2.5 mm (0.1″)	±4 mm (0.15″)
Lack of fusion	64 mm (2.5″)	13 mm (0.5″)	3.8 mm (0.15″)	ID Surface Breaking	±4 mm (0.15″)

7.4 Longitudinal and Transverse Cracks in a SingleV 9.5 mm thick plate

File name: Example_LongitudinalCrack_TransverseCrack_SingleV_10mm_UT3548B_T1-PE-7_5M30E0_6P-35W.huf

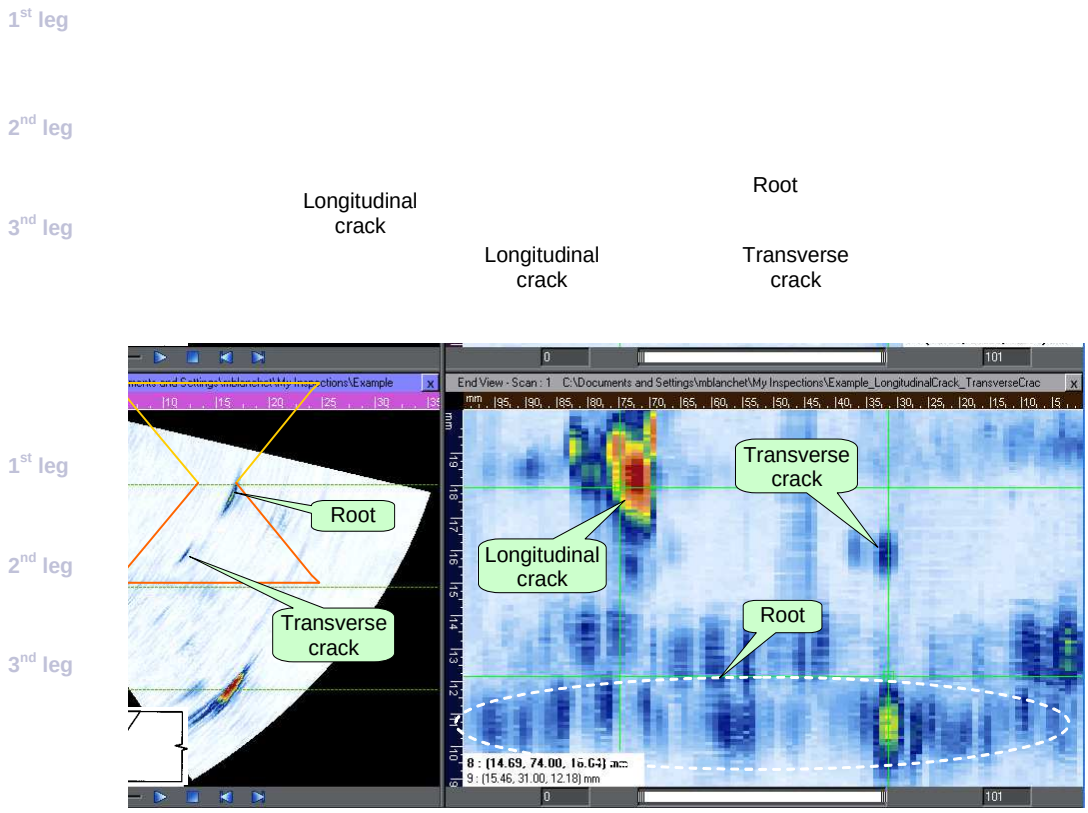


Figure 7: Longitudinal crack and transverse crack in a singleV grinded flush 9.5mm thick plate

Table 7: Main configuration parameters

Probe	7.5 MHz, Integral 35°	Gain	20.0 dB
Focal Distance	30.0 mm	Start/Stop Angle	35.00°, 77.00°
Focalisation Type	Constant Path	Start/Stop Path	14.81 mm, 44.95 mm

Table 8: Main values synthesis

Flaws	Start of the flaw to reference	Total flaw length	Flaw height	Flaw depth (below surface)	Location tolerance
Longitudinal crack	74 mm (2.9″)	8 mm (0.3″)	3.8 mm (0.15″)	Surface Breaking	±3.2 mm (0.125″)
Transverse crack	33 mm (1.3″)	10 mm (0.4″)	3.8 mm (0.15″)	Surface Breaking	±3.2 mm (0.125″)

7.5 Root Crack and Slag Inclusion in Root in a SingleV 9.5 mm thick plate

File name: Example_RootCrack_Slage_SingleV_10mm_UT3546B_T1-PE-7_5M30E0_6P-35W.huf

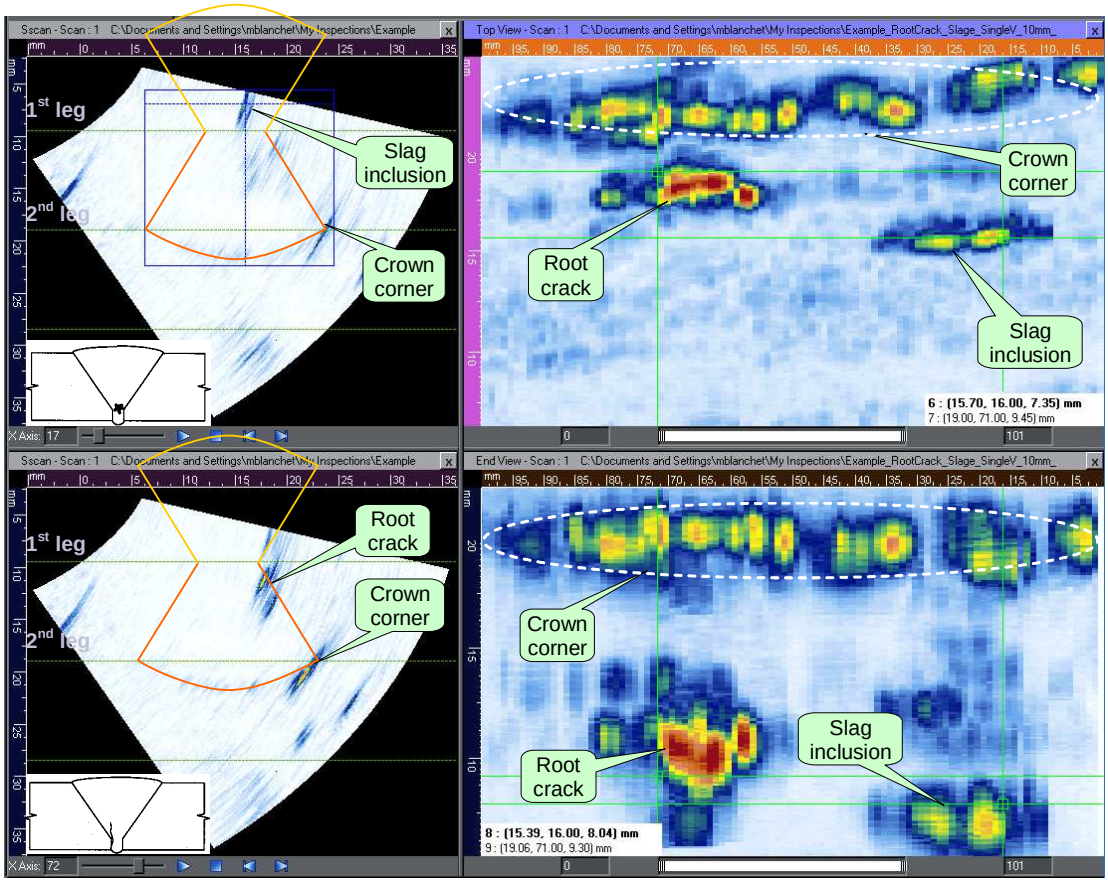


Figure 8: Root crack and slag inclusion in root in a singleV 9.5 mm thick plate

Table 9: Main configuration parameters

Probe	7.5 MHz, Integral 35°	Gain	17.5 dB
Focal Distance	30.0 mm	Start/Stop Angle	35.00°, 77.00°
Focalisation Type	Constant Path	Start/Stop Path	14.81 mm, 44.95 mm

Table 10: Main values synthesis

Flaws	Start of the flaw to reference	Total flaw length	Flaw height	Flaw depth (below surface)	Location tolerance
Root crack	64 mm (2.5″)	13 mm (0.5″)	3.8 mm (0.15″)	ID Surface Breaking	±4.0 mm (0.15″)
Slag inclusion	13 mm (0.5″)	20 mm (0.8″)	3.8 mm (0.15″)	5 mm (0.2″)	±4.0 mm (0.15″)

7.6 Toe Crack and Lack of Fusion in a SingleV 9.5 mm thick plate

File name: Example_ToeCrack_LackOfFusion_SingleV_10mm_UT3545B_T1-PE-7_5M30E0_6P-35W.huf

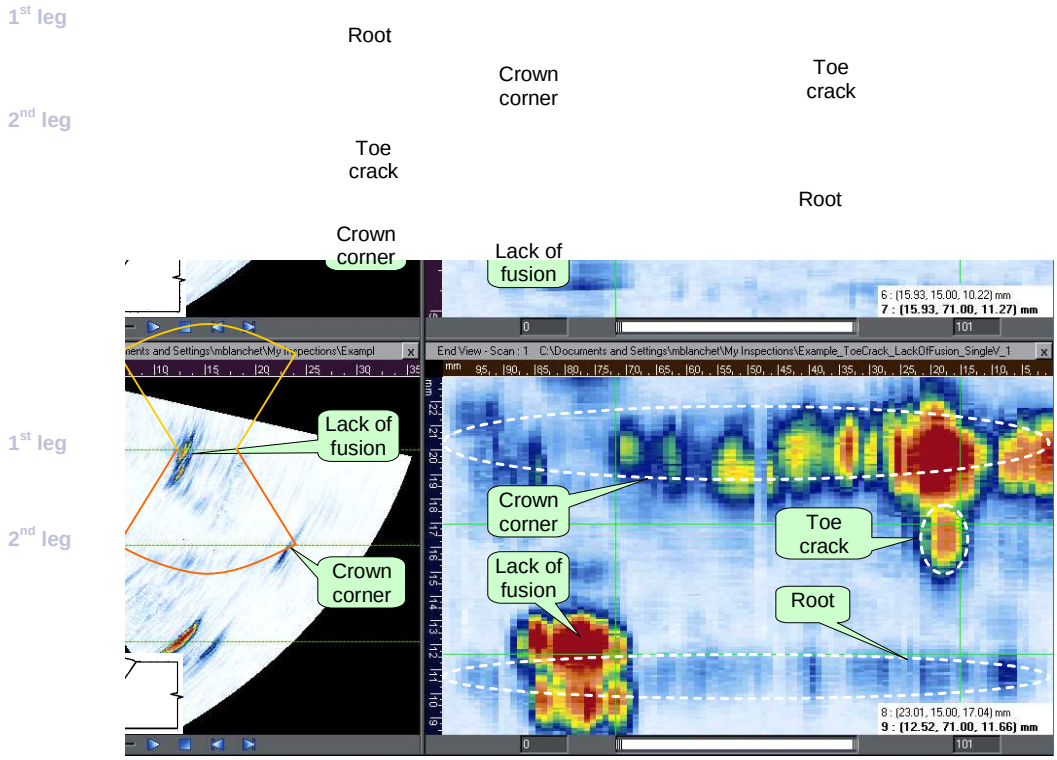


Figure 9: Toe crack and lack of fusion in singleV 9.5 mm thick plate

Table 11: Main configuration parameters

Probe	7.5 MHz, Integral 35°	Gain	17.5 dB
Focal Distance	30.0 mm	Start/Stop Angle	35.00°, 77.00°
Focalisation Type	Constant Path	Start/Stop Path	14.81 mm, 44.95 mm

Table 12: Main values synthesis

Flaws	Start of the flaw to reference	Total flaw length	Flaw height	Flaw depth (below surface)	Location tolerance
Toe crack (crown)	15 mm (0.6″)	8 mm (0.8″)	3.8 mm (0.15″)	Surface Breaking	±4.0 mm (0.15″)
Lack of fusion (root)	71 mm (2.8″)	13 mm (0.5″)	3.8 mm (0.15″)	Surface Breaking	±4.0 mm (0.15″)